

0 Introduction.

Based on a feasibility study executed in November 2004, The Ministry of Agriculture, Forestry and Fisheries of the Kingdom of Cambodia (MAFF) and The Netherlands Development Organisation (SNV) have agreed on cooperating in the set-up and implementation of a National Biogas Programme.

The terms of this cooperation are laid down in a Memorandum of Understanding which was concluded in May 2005. An implementation document for the programme period was compiled early 2006 and agreed upon by MAFF and SNV during an official ceremony in March 2006.

The duration of first phase of the National Biogas Programme is 4.5 years of which the last 6 months of 2005 and the first 3 months of 2006 were used for preparation and the years 2006-09 for implementation.

The overall objective of the first phase of the National Biodigester Programme is **'The dissemination of domestic biodigesters as an indigenous, sustainable energy source through the development of a commercial, market oriented, biodigester sector in selected provinces of Cambodia'**.

The programme is currently operational in 8 provinces after being started in 3 provinces in April 2006.

1 Objectives

The BUS has 2 principal objectives:

1: to evaluate the effect of domestic biodigester installations, as perceived by the user, by conducting a representative quantitative survey¹ in 8 provinces in Cambodia as well as how they have experienced the programmes activities such as promotion, construction, quality assurance, training and after-sales service.

2: The compilation of a monitoring report which is subject to verification by a DOE. This report has as prime objective to verify the emission claims as stated in the PDD and includes the monitoring of the sustainability parameters as listed in the Gold Standard Passport.

To this extent, the survey shall assess and where possible quantify aspects of domestic biodigesters (energy, agriculture, health & sanitation, environment, financial, workload) for as far as they have a bearing on the biodigester households.

1.2 Specific objectives

¹ The consultant will have to justify the sample size in his proposal using the guidance given by the GS-VER biodigester methodology

The specific objectives include surveying:

- a. the socio economic characteristics of the sampled households;
 - hh location and structure
 - educational level of adults in the household
 - landholding, economical activities, income
 - number and type of livestock that contributes to the feeding of the biodigester
 - other livestock

- b. Pre-construction information and decision making process;
 - motivation of the households for the installation of the biodigester
 - pre-construction information sources and information quality in relation to the delivered product
 - decision making process in the household, persons involved and time required
 - what is the size of the plant and why

- c. Construction process;
 - who conducted the feasibility visit (form no.2) and was the owner appropriately consulted?
 - is the site where the plant is built well chosen?
 - is the size of the plant well chosen?
 - was the plant built in the time specified in the contract and/or as promised verbally?
 - was the mason skilful enough, is the plant of a good quality?

- d. Training/Instructions;
 - were the user and owner properly informed by the mason on plant initial feeding
 - received information and/or training on operation and maintenance
 - presence of user manual on O&M, explanation of the manual

- e. Plant operation;
 - is the plant in operation and if not, why?
 - who operates the plant (feeding, small maintenance, gas use)?
 - how regular are the feedings and what is the quantity of dung per feeding?
 - difficulties in plant operation
 - use of stoves, how many and how many hours per day per stove?
 - use of lamps, how many and how many hours per day per lamp?
 - use of main gas valve
 - use of the water drain
 - other gas use if any
 - satisfaction level with plant operation (the work that needs to be done)
 - satisfaction level with gas production
 - satisfaction level with stove functioning
 - satisfaction level with lamp functioning
 - satisfaction level with other gas use if any

- f. Energy savings and financial consequences;
- what has been the total plant cost
 - is the composition of the total cost know (building materials, appliances, skilled- unskilled labour, participation fee and guarantee fee), if so, how much are they?
 - quantified evel of daily fuelwood use before and after plant installation
 - quantified level of daily charcoal use before and after installation
 - quantified level of kerosene use before and after installation
 - frequency of battery charging before and after installation
 - money spend on the above before and after installation
 - how was the plant financed, own reserves or bank loan
 - was the invoicing of the plant installation cost transparent and correct?
 - is the plant installation financially worthwhile?
 - has a subsidy been provided, if so, how much and how quick?
- g. Bio-slurry;
- use of dung before plant installation
 - use of dung after installation
 - If not used, why not
 - if used, in what manner (wet, semi dry, dry), as fertiliser, as fish feed, other
 - slurry storage manner (wet in a pit, composted with other materials in open air, composted with other materials in a compost hut)
 - Is the slurry pit covered by a roof?
 - If no, state reason
 - usefulness/effectiveness of bio-slurry compared to traditional FYM
 - use of chemical fertiliser before and after plant installation
 - information provided on bio-slurry use, by whom and what quality?
 - has a slurry manual been provided and if so, is this manual useful?
- h. The effect of the plant on the household and agricultural practices;
- has the use of the plant led to work increase or decrease, if so, elaborate
- i. –estimation of the number of hours saved
- j. – who in the household benefitted the most in terms of time savings from the biodigester
- has the use of the plant led to changes in animal husbandry and manure collection (number of animals, way animals are kept, stable improvements, frequency of manure collection, cultivation of fodder crops, ...)
- k. The effect of the plant on household and animal hygiene;
- has a toilet been connected to the plant, if not, why not?
 - is there a provision for toilet connection (toilet pipe) installed?
 - are the farm yard and stable cleaner after the plant installation?
 - is the kitchen cleaner after the plant installation?
 - what is the effect of the plant on indoor airpolution?
 - has cooking become safer after plant installation?

- is there a noticeable effect on the human health?
 - is there a noticeable effect on the animal health?
- I. After-Sales service;
- has a guarantee certificate been provided, please check
 - are the guarantee conditions clear
 - are the guarantee conditions all right
 - has the mason come to check upon the plant, if so, was this recorded on the guarantee certificate's back side?
 - what has been the time period between the completion of the plant and the first control visit?
 - what is been the time period between follow-up visits
 - were these visits useful?
 - what did the mason do during the visits, did he physically check the plant, appliances, stable?
 - are there plant problems that were not attended to by the mason?
 - have there been complaints on the plant functioning addressed to the mason and/or PBPO supervisor and, if so, what was the effect?
- m. Observations;
- traditional (wood or charcoal) stoves present and obviously in use
 - cleanliness of the kitchen and kitchen utensils, sooth, ashes, fuelwood and charcoal
 - condition of the stable, hard floor, clean, ...
 - condition of appliances, stoves with taps hosepipe, lamps with valves
 - condition of the plant, inlet, main valve/ turret, top filling, outlet, drain pit
- If possible, make photographs.
- n. Well founded and justified recommendations from the consultant on programme improvements as well as listing of strong points;

Where relevant and appropriate, the survey shall collect data for gender and children.

For the consultant's reference, a questionnaire of a previous BUS is annexed to this ToR. The consultant is invited to suggest improvements on the above list.

2 Survey sample.

To limit the sample error in order avoid a downward correction in emission reductions, a sample size with a confidence level of at least 95% and a precision level of 10% is required², (95/10), guidance can be found online: <http://edis.ifas.ufl.edu/PD006> and <http://www.raosoft.com/samplesize.html>.. With a total biodigester population of 5000, a sample size of 100 plants is more then required. The households shall be selected on a random sample basis by Hivos Climate Fund among all biodigesters.

3 Approach and methodology.

After awarding the contract, the consultant will start with a desk study including relevant programme documents, information on biogas and animal husbandry in Cambodia and previous BUS conducted under the NBP.

Based on the desk study, the consultant will formulate the data-collection tools, such as structured questionnaires for households, PNBPs and biodigester technicians, focus group discussion guidelines, check-lists, observation sheets etc.

The consultant will test the (draft) data-collection tools during a field-testing exercise with the principal resource persons. Prior to the survey, the consultant will conduct an intensive training for all members of the Field Survey Team.

4 Work schedule.

Tentatively, the survey will be implemented from to , for a period of 10 weeks, including ~ 2 weeks for the preparatory works, ~4 weeks for the Field Survey and ~ 4 weeks for data processing and formulation of the draft report. The final report will be submitted within two weeks after approval of the draft report by the NBP.

5 Deliverables.

5.1 Proposal of the consultant.

Based on this ToR and information provided by the NBP on the BUS consultant meeting (date to be set), interested consultants will develop a proposal for the survey. Consultants are

² The minimum sample size is 60 delineated by the GS-VER biodigester methodology. A level of precision of 95/10 is justified based on the UNFCCC guidelines: http://cdm.unfccc.int/Panels/ssc_wg/meetings/020/ssc_020_an14.pdf, the minimum level of precicion is according to the UNFCCC is 90/10

encouraged to suggest improvements to the ToR. The proposal shall be submitted in two separate sections:

Section 1, technical proposal, including:

- a tentative work schedule for the survey;
- an outline of the proposed data-collection tools and methodology;
- any suggestions for improvement of the ToR and/or the survey
- the names, CVs and responsibilities of the proposed members of the Survey Team.

Section 2, financial proposal, including:

- cost break down;
- proposed budget.

5.2 Inception report.

Prior to the mobilisation of the Field Survey Team, the consultant will submit for approval to the NBP two copies of the Inception Report in English. This report will incorporate:

- the main findings and observations following from the desk study;
- the final-draft data collection tools proposed and developed by the consultant;
- a detailed work schedule for the survey;
- the proposed table of content for the draft report.

The NBP shall provide comments and suggestions on the inception report within 3 working days

5.3 Draft Biogas User Survey report.

The data collected from the field survey shall be checked and verified by the consultant expert team prior to processing.

The consultant shall submit a soft copy of the draft Biogas User Survey report. The report shall include:

- approach and methodology of the study;
- review of the relevant desk-study findings;
- discussion on major findings;
- analysis of the users' satisfaction, implications and issues;
- a separate chapter on the monitoring findings according to the guidance provided in the PDD and the Gold Standard Passport
- suggestions and recommendations;
- all processed original data including photos.

The NBP shall provide comments and suggestions on the draft report within 10 working days.

5.4 The final Biogas User Survey report.

The consultant will finalise the draft report, incorporating the comments and suggestions received from the NBP and –if necessary- other relevant and knowledgeable institutions and persons. The final report will be submitted in English on CD.

5.5 Biogas User Survey Workshop

After the acceptance of the final report the consultant will facilitate a one day workshop to explicate the followed methodology and the survey data processing.